Fact Sheet

Swine Reproduction

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Managing Sows and Gilts during Breeding and Gestation for Efficient Reproduction

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Every producer should give the highest priority to management of females in the breeding herd to achieve maximum reproductive efficiency. Good management will pay dividends by increasing the number of live pigs farrowed. The more live pigs farrowed, the greater the likelihood that there will be more at market weight. The purpose of this fact sheet is to identify important points of reference in the reproductive life of the sow which respond to good management by yielding additional live pigs at farrowing.

Prebreeding Management

Selection of females for replacements is only the start of managing for highest reproductive efficiency. A good indication of the female's ability to function normally is whether she will start coming into heat at an early stage. Gilts may start cycling as early as 5 months of age (Table 1). The general recommendation regarding age at first breeding has been to wait until the third heat to take advantage of any increase in ovulation rate. The decision to breed on first or third heat should be based on more factors than the possibility of increasing ovulation rate by one or two eggs. Fluctuating prices for feed, labor and facilities, salvage value of breeding stock, marketing expectation, etc., can create situations that make it unprofitable to wait until 8 or 9 months of age before breeding gilts.

Table 1. Puberty, estrus and ovulation.

Age at puberty	5-8 mo.
Weight at puberty	150-250 lb.
Duration of estrus	1-5 da. (2 = average)
Length of estrous cycle	16-25 da. (20-21 = avg.)
Weaning to estrus	3-8 da. (5 = average)
Time of ovulation	40 hr. (from onset of estrus)

Mixing pens of confinement-reared gilts and regrouping them with direct boar contact is likely to start gilts cycling earlier than without any treatment. This may help synchronize the first heat and, to a lesser degree, the second heat.

The problem of seasonal differences in age at first heat should be mentioned here. In general, researchers in Canada and at North Carolina State have found that a higher proportion of fall-born gilts reach puberty at a lighter weight and at a younger age than spring-born gilts. Boar exposure decreased age and weight at puberty in spring gilts but not in fall-born gilts. In the Canadian report an average of 9.7% of the gilts weighing 195-200 lb. that were slaughtered from June through September had reached puberty; whereas an average of 22.8% of gilts slaughtered from January through June had attained puberty.

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Anestrous conditions (absence of standing heat) may be the result of a number of conditions:

1. Faulty heat detection methods
2. Hot weather stress
3. Silent heat (ovulation with no visible sign of heat)
4. Sickness
5. Nutritional (lack of protein or energy)
6. Social stress

Heat detection is of critical importance and can be the cause of most problems. Heat is the time the female accepts the male for mating. A good method to detect heat is to bring a boar into a pen of females. The producer himself should apply back pressure to each female in the presence of the boar. Females that are truly in "standing heat" will allow the man to sit on their back, and they will respond by standing solidly and attempting to stiffen their ears erect (called "popping-their-ears"). If females do not stand solidly and pop their ears, they are not in heat. In gilts especially, the vulva may be swollen and/or nervousness may be noticed before and after standing heat.

Hot weather is a real detriment to good reproductive efficiency. High temperature (above 85 F.) will delay or prevent the occurrence of heat, reduce ovulation rate and increase early embryonic deaths. Michigan studies showed that gilts exposed to 104 F. for 2 hours daily from 1 to 13 days postbreeding can reduce embryo survival by as much as 35-40%. Other studies at Illinois and Oklahoma show similar results from heat stress. Remember that animals suffer heat stress not only when atmospheric temperatures go above 85 F. but also when they get sick and have a fever. More variation in the length of standing heat can be expected due to hot weather. Not only does temperature have detrimental effects but also decreasing length of days and relative humidity can interact to multiply the problems a producer may encounter during the summer months. An individual producer must do a good job of selecting replacement breeding stock that are reproductively efficient under his management system to minimize the effects of heat stress.

Heat's effect on the boar can be briefly summarized by saying that when rectal temperatures increase by as little as 1 F. for 72 hours, sperm production is decreased by 70% or more, and recovery takes 7-8 weeks.

Synchronization of heat in sows is a relatively simple matter when pigs are weaned from a group of sows at the same time. A high proportion of sows that are in good physical condition will begin to come into heat within 3-7 days postweaning. Adequate boar power is essential for synchronization of postweaning heat to be effective. If your sows do not respond, analyze your production system and try to determine the cause.

Keep group sizes to 15 or less if possible to minimize peck-order fighting and to help insure that all females receive their day's ration of feed. The use of individual stalls may prove to be economically feasible to cut down social stresses associated with the breeding herd.

Diseases such as leptospirosis, pseudorabies and those associated with the "SMEDI Syndrome" (S = stillbirths, M = mummified fetuses, ED = embryonic death, I = infertility) may increase the problem of getting sows or gilts to settle.

There is reason to believe that sows can and do come into heat with their litter still nursing especially if lactation lasts beyond 5-6 weeks. If a sow does express heat while she is nursing, she may not necessarily return to heat within 3-7 days postweaning.

Selection for sows that do cycle within 7 days postweaning is very important to keep management schedules running smoothly. A number of producers use early return to heat as a prime consideration for retaining sows in the breeding herd. This criterion automatically selects a female capable of successfully contending with the stresses of living in a particular environment. If a sow fails to conceive within 28 days postweaning, she should be culled. This is enough time for her to have been bred twice. With each 21-day delay, the sow must produce 2 extra pigs just to pay for the time and feed she has consumed. Similarly, if gilts do not conceive after being bred three times, they should also be culled so as not to increase the number of "hard breeders" in future generations.

Weaning is recommended at 3-4 weeks of age so the sow can be returned to production as soon as possible. Results of one study conducted in England show a decrease of about 3 pigs per litter when sows were weaned and bred before 21 days' lactation. Weaning groups of sows at an average age of 3½ weeks is a good practice to follow.

If postweaning scours are a problem, postpone weaning for another week or more; then leave the litter in the farrowing area an additional week. This will extend scours protection provided by the sow's milk. An extra week will allow additional time for the pigs to get started eating dry feed. Sows in thin condition should be on a flushing ration or at least in a weight-gaining status before breeding. This will assure maximum ovulation rate as far as nutrient intake is concerned.

Products which stimulate follicle growth and subsequent heat, such as pregnant mare's serum (PMS), should be used only after the producer consults with a specialist in reproductive physiology. These products should be considered only if sows are not returning to heat as they should.

If there is any question about the health status of the breeding herd, consult with a veterinarian and review your herd health program.

Breeding

The all-important factor in achieving a high conception rate and good litter size is to get sperm into the female's reproductive tract at the time when pregnancy rate and litter size will be maximized. Regardless of the method of

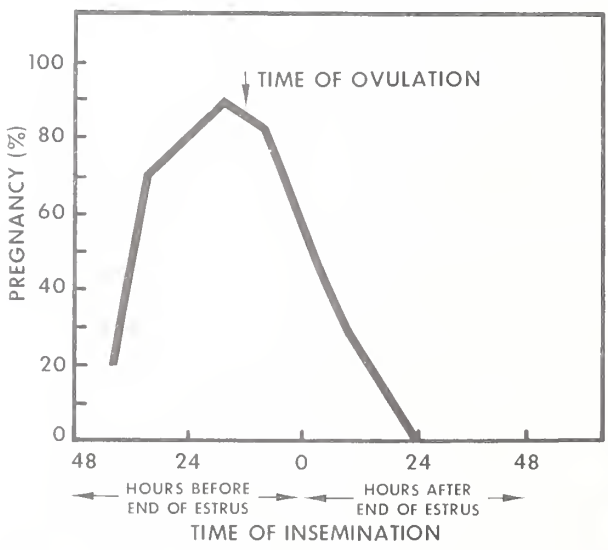


Figure 1. Effect of time of insemination on pregnancy rate in swine.

breeding (i.e., pen mating, hand mating or artificial insemination), an adequate number of live sperm must be in the tract a few hours before ovulation occurs or conception rate and litter size will be reduced. Figure 1 shows the effect on conception rate of breeding at various times in relation to occurrence of ovulation. Notice that a female will ovulate 8-12 hours before the end of standing heat (37-40 hours after the onset of standing heat). When mating occurs too early or too late, conception rate drops very rapidly.

The general recommendation for optimal breeding is based on the number of times per day a producer checks the females for signs of standing heat. With once-a-day heat detection, breed the females each day they will accept a boar. With twice-a-day detection, breed at 12 and 24 hours after they are first detected in heat. Heat detection should always be done in the presence of a boar to maximize the chances of detecting all possible females in heat. This applies specifically to producers using hand breeding or artificial insemination rather than pen breeding.

Abnormalities in the estrous or heat cycle do occur. Gilts will sometimes have less than a 2-day heat period. If this happens, they are most apt to ovulate shortly after going out of heat. If short heats are a problem, then gilts should be bred as soon as they are detected in heat and each succeeding 12 hours they will stand. When the period of male receptivity lasts longer than 3 days, chances are females may not conceive, so it is probably a waste of time and boar power to continue to breed her after the third day.

Producers using pen mating must use plenty of boar power. The ratio used by the most successful breeders is 8-10 sows for each mature boar (over 1 year) per 21-day breeding period. Decrease that ratio to 4-6 sows for each young boar (less than 1 year). A sow-to-boar ratio of 4-1 for mature boars and 2-1 for young boars is recommended when sows are weaned in groups. When hand mating, the mature boar should not breed more than 2-3 females a day if he is to be used intensively for more than a couple of days, or the sperm reserve and sex drive can be decreased. Artificial insemination is extremely useful in this situation since it is possible to breed 10 or more sows with the sperm collected in one ejaculate.

An additional boost in conception rate and litter size can be obtained by using more than one boar on each female. This maximizes the chance that a highly fertile and compatible boar will be used on the female. This is easiest to accomplish when using hand mating or artificial insemination but can also be done simply by rotating the boars at least once every day with pen breeding. Rotation from pen to pen will also stimulate sex drive in the boar.

The labor requirement is lowest for pen breeding. However, in most cases breeding dates are not known, so if one is to be present during farrowing, a greater amount of time spent in the farrowing house is required. Less is known about the mating performance of the boar or females; therefore, breeding problems such as bleeding, inability to couple properly and others are more likely to occur without being noticed, making it more difficult to keep accurate records of individual performance.

Pregnancy diagnosis has become a reality. With the ultrasonic detectors, a producer can find out with a 90-95% accuracy how many females have settled. These machines are most accurate and give the best return per dollar invested when they are used between 30 and 45 days after breeding. They can be used later, but the economic advantage and accuracy drop off rapidly after 45 days.

Most producers do not remove open females from the gestation pens much before 90 days, if then. Assume feed costs alone amount to 35-50 cents per day for open or pregnant females, and that an average of 10% of all females bred will not conceive. With these assumptions it costs about $30 to maintain an open female between days 30 to 90 postbreeding or a pregnant sow must produce 3 more pigs than the herd average just to pay for each open female's feed cost. On this basis a producer farrowing 300 litters per year can pay for a pregnancy testing machine within two years.

It is important that brood sows and gilts get the proper amount of nutrients for successful reproduction. Feeding in excess is not only wasteful and costly but may increase embryonic mortality. A limit-feeding system using balanced, fortified diets is recommended. It insures that each sow gets her daily requirements of nutrients without consuming excess energy.

As a rule of thumb, 4 lb. of a balanced ration will provide adequate protein and energy; however, during cold weather an additional pound of feed may prove beneficial, especially for bred gilts. With limit-feeding it is extremely important that each sow gets her level of feed and no more. Three systems may be used to restrict energy intake of gestating females—daily individual limit-feeding, interval feeding and self-feeding high-fiber diets.

The daily feeding of a limited amount to each individual is the best system, and its success is based on having an adequate number of feeding stalls or space for individual animals. The individual stall is best because it prevents the "boss sows" from taking feed from slower eating or timid sows. However, individual feeding takes more labor if it is not mechanized. Self-feeding takes less labor but is the least acceptable method for two reasons: (1) it costs more to maintain sows, and (2) it is very difficult to keep females from getting too fat.

Keep sows and gilts separate during breeding and gestation to avoid injury that may cause death of the developing embryos. Comfort and contentment of the bred females are equally important in efficient reproduction. If gestating females are grouped, keep them in as small a group as is feasible for the facilities. The use of individual pens or stalls for gestation should be considered in highly intensive production systems.

Many producers bringing new breeding stock into their herd create situations that increase the problems associated with SMEDI. This is done when new animals are not properly quarantined for 60 days. All new breeding stock should be totally isolated for 30 days. Then during the next 30 days, start comingling by direct contact or reciprocal feeding of fecal material of the new livestock and open females only. In this way the open females will be able to build an immunity to any new organisms they may encounter. If the new boar or gilts have a new virus and it gets into the bred females, all of the signs of SMEDI mentioned previously may show up. In addition, near the end of the initial 30-day isolation, test mate boars to females to be culled to get a check on breeding ability. Use cull females so that if new "SMEDI organisms" are present the effect will not be costly.

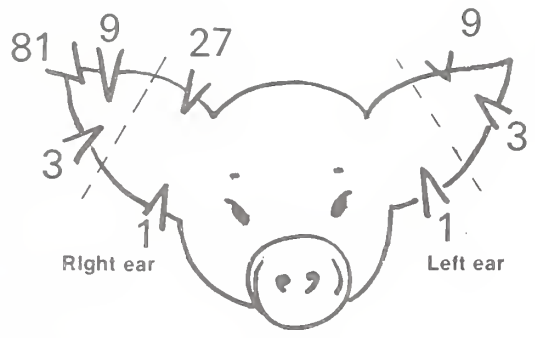
Farrowing Management

Be present when sows farrow, but do not offer any assistance unless necessary. Keep sows as calm and

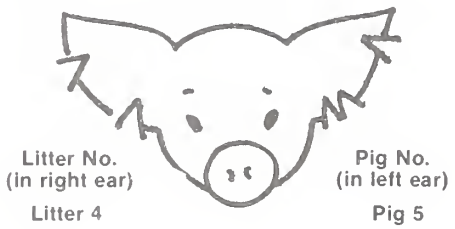
comfortable as possible. The average interval between births is approximately 15-20 minutes unless a problem develops. Producers with more experience in handling farrowing problems may assist the sow in trouble. If unable to help, consult a veterinarian as soon as possible. Keep the pen clean and remove all afterbirth. Make sure sows have plenty of fresh water. Check them closely and be sure they remain in good health and properly care for their pigs.

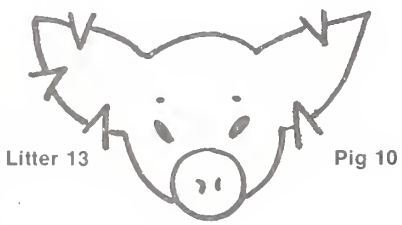
Records

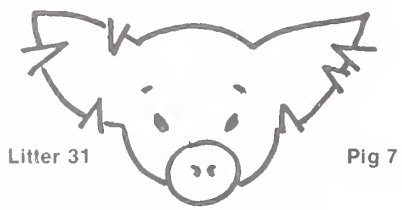
Records in swine production are essential. To keep accurate records, hogs must be identified. A good way to identify individuals is by ear notching at farrowing. Figure 2 shows a good ear-notching system. If this system of notching does not have enough capacity, then another system such as individual numbers will have to be used.



Example







Litter numbers are written first.
EXAMPLE: 4-5 means litter 4, pig 5.
31-7 means litter 31, pig 7.

Figure 2. A good ear-notching system.

Figure 3. Sow record.

Sow number	_____
Sire number	_____
Breeding date	_____
Farrowing date	_____
Litter number	_____
Number farrowed	Live _____ Dead _____
Weaning date	_____
Number weaned	_____
Weaning weight	_____
Farrowing problems	_____
Other	_____

Records should be kept on each sow and litter. Figure 3 shows an example of a sow record card. Data from individual record cards can be recorded into a permanent record book, and a summary prepared as a partial base for future selection of breeding stock.

Additional records are desirable in many circumstances to utilize boar power more efficiently and identify breeding problems early. Keep records of the frequency of boar services and, if artificial insemination is used, the date and volume of each ejaculate collected. A record of the date and duration of heat is essential in predicting when females will next be in heat, in calculating dates for return to heat if conception does not occur, pregnancy checking dates, and the day to bring them into the farrowing house.

Summary

Gilts should be selected as replacements on the basis of their ability to come into heat at an early age and conceive within 3 heat periods after their first exposure to a boar. Sows should be selected on the basis of ability to conceive within 7 days after weaning or the earliest time that fits your management schedule.

No matter how sperm are placed in the female's reproductive tract, they must be there a few hours before ovulation to maximize the chance of getting the best pregnancy rate and litter size.

During gestation gilts should be fed so they will gain about 75 lb. and sows should gain about 30 lb. Lactation should last 20-28 days to help insure that baby pigs get a good start and to insure a high rate of embryo implantation in the sow at the first postweaning heat. At farrowing, additional pigs can be saved if an attendant can be present. This also affords the opportunity to correct problems if they occur. Adequate records of individual performance during all phases of the reproductive cycle will be of benefit in upgrading the herd and making it more profitable.

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